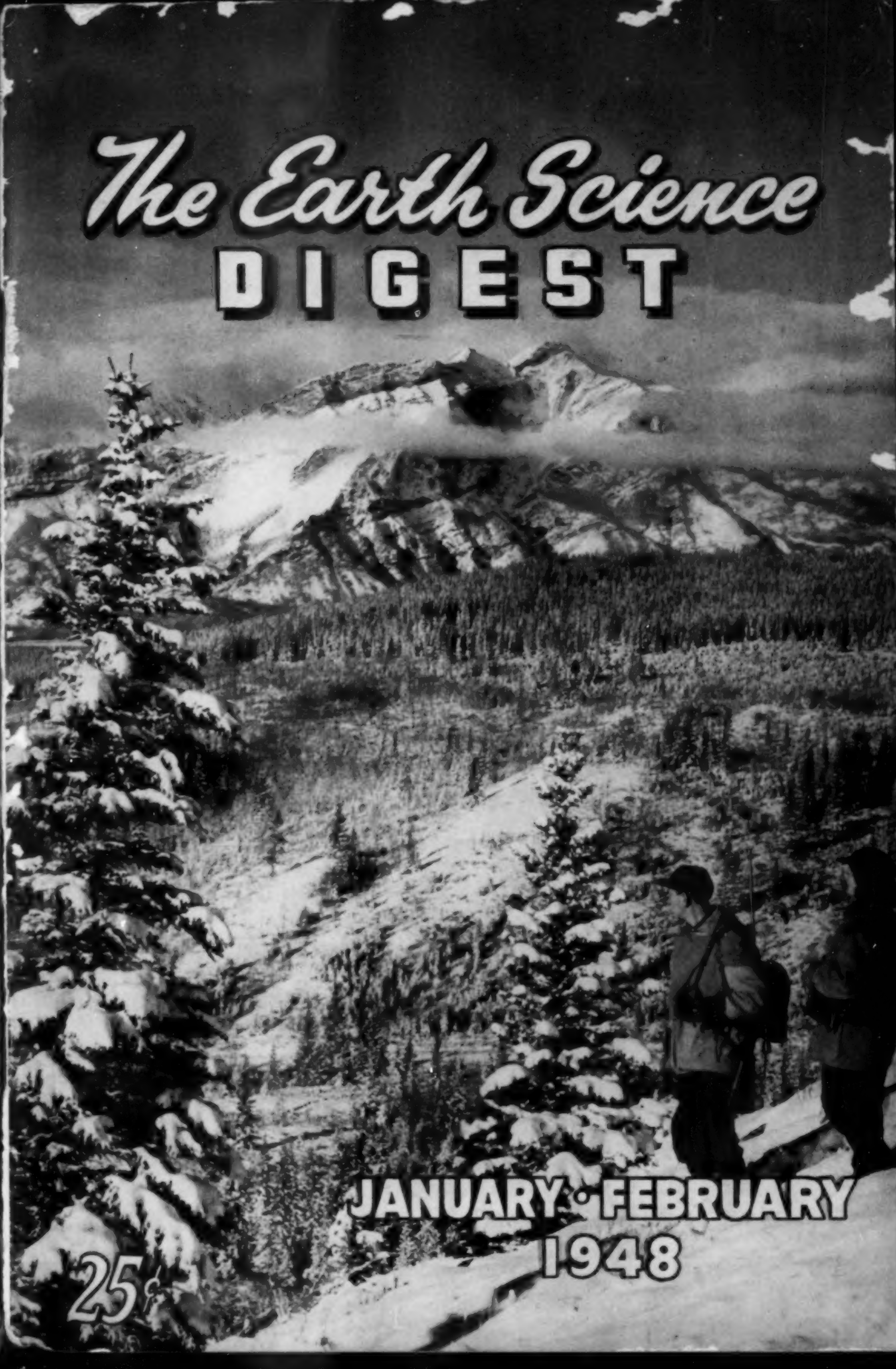

The Earth Science
DIGEST
JANUARY · FEBRUARY
1948
25¢

LAPIDARY HOBBYCRAFTS, INC.

THE COMPLETELY RUSTPROOF MODEL 1-A "GEMLAP" GRINDER AND POLISHER

MODEL 1-A "GEMLAP"

Polished Cast Aluminum Body. Deep pan prevents overedge spray and wheel flooding.
Three leg mounting for stability cast integral with pan.
"Compo" oil-retaining porous bronze shaft bearings REQUIRE NO OILING.
Monel metal spindle shaft machined integral with thrust collar.
Monel metal faceting head, shaft.
Monel metal spindle washers machined parallel for true running wheel.
Everdur non-corrosive spindle nut.
Diecast balanced 3-step pulleys.
Newly developed polished cast aluminum non-spill air vent type lube dispenser with constant air pressure, visible supply and variable positioner.
All brass drain cock and micro-drip lubricant valve.
Horizontal grinding and polishing for maximum operating visibility.
Each "GEMLAP" machine serially numbered for your protection.
Complete set of material and supplies.
Assortment of rough gem stones.
Manual on the art of gem making.

INCLUDED WITH THE "GEMLAP" MODEL 1-A GRINDER AND POLISHER ARE THE FOLLOWING MATERIALS & SUPPLIES:

1—6" Silicon Carbide 120 Grit Grinding Wheel.
1—6" Tapered Cast Iron Lapping Wheel.
1—6" Hard Felt Buffing Wheel.
2—6" Silicon Carbide 180 Grit Discs.
2—6" Silicon Carbide 320 Grit Discs.
2—6" Silicon Carbide 400 Grit Discs.
1— Bottle 600 Grit Grinding Compound.
1— Bottle Finish Polishing Compound.
6—Assorted Dop Sticks.
1—Stick Dop Cement.
1—Three Step Die-Cast Motor Pulley.
1—32" V-Belt.
1—Treatise and Manual on the Art of Gem Grinding and Polishing, prepared for the Amateur Lapidarist.
1—Assortment of Rough Gem Stones.

PRICE COMPLETE, less motor, $37.50 F.O.B.

LAPIDARY HOBBYCRAFTS, INC.

1265 WEST 76TH STREET CLEVELAND 2, OHIO

The Earth Science Digest

Box 57 Omaha 3, Nebraska

A magazine devoted to the advancement of the geological sciences.

Robert B. Berry, Founder

THE EARTH SCIENCE DIGEST is open to articles of geologic interest. Manuscripts, photographs and sketches will be returned if accompanied by ample first-class postage.

Subscriptions: 1 year, $2.00; 2 years, $3.00; 3 years, $5.00. Single Copies, 25 cents.

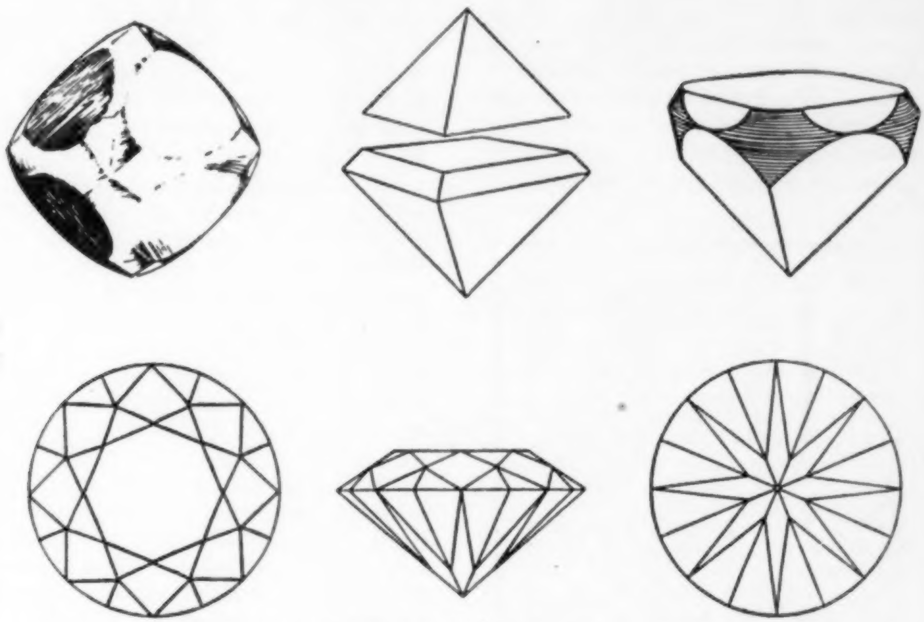
Alice L. Hart, Circulation and Business Manager

Vol. II Jan.-Feb. - 1948 No. 5

Contents

THE ART OF DIAMOND CUTTING

Engineering and Artistry Are Combined To Produce Beauty and Brilliance



Characteristic diamond shape is the octahedron, as shown in upper left. The rough stone is cut into two parts (upper center) and then "rounded" by grinding off the corners (upper right). Below, the standard brilliant cut. The top (left) has 33 facets and the bottom 25 facets. Lower center is side view.

George R. Kaplan

The rough diamond is usually found as an octahedron, most easily pictured as two four-sided pyramids set base to base. However, the majority of diamonds are not perfectly regular in shape, but instead are usually more or less flattened or elongated in one direction or another, and the octahedron almost always has characteristically rounded edges.

The problems of converting this rough, lifeless mineral into beautiful gems fall into two general classes; the first arising from the nature of the diamond itself, and the second from the use to which the gem is put.

The diamond's unique hardness is well-known. It is not only harder than any other substance in the world, but almost incomparably so. Therefore, in shaping or cutting diamonds, the only possible agent is another diamond. Furthermore, the diamond's hardness varies slightly in different directions. The diamond cutter refers to this difference in hardness as the "grain" of the diamond. He knows that he can polish a facet in a certain direction, but that if he shifts the diamond's position even slightly, he will encounter a harder direction, and then, no matter how long he tries to polish that diamond, he will not make the slightest impression on it. This problem of "grain" is a fascinating one. If one were to line up a million sound diamond crystals in exactly the same positions, the "grain" for any given facet on one of those crystals would be the same in all the other diamond crystals. Furthermore, the slightest shift in the orientation of that facet means a corresponding shift in the "grain" in every one of those crystals.

The author of this article is a member of the firm of Lazare Kaplan & Sons, Inc., 630 Fifth Avenue, New York City. Mr. Lazare Kaplan worked on the largest diamond ever cut in the United States, the famous Jonker, a stone of 726 carats which was discovered in 1934 in alluvial diggings in South Africa. The Jonker diamond was found three miles from the Premier mine, Pretoria, where the Cullinan diamond (3,106) carats), the world's largest, was found in 1905. The Jonker was reported to have brought a price of about $300,000 before cutting. Mr. Kaplan cut it into 12 stones, having a total weight of 370.87 carats, or 51 per cent of the original weight—an unusually high yield for a diamond of this size.

Cleavage is another important quality of the diamond. The diamond divides easily and perfectly along its four octahedral directions. To the skilled diamond cutter this means that he has four directions in which he can divide the rough diamond to eliminate imperfections and secure more symmetrical shapes; to the ultimate user of the diamond, cleavage is the reason why he must be very careful never to strike the diamond against any hard surface.

Cleavage is accomplished by first deciding exactly where along the plane of cleavage the stone is to be split. Then, with fastidious exactness, a deep groove is cut exactly along this line by scratching with sharp-edged pieces of diamond. When the groove has the proper orientation and proportions, a steel wedge is introduced into the groove. The wedge must fit into the groove so that it rests midway on each shoulder of the groove. Therefore, when the wedge is struck, it exerts a uniform spreading action of the diamond, which must split as planned if the operator has been properly skillful.

The only other method of dividing a diamond is by sawing it. The diamond is held against a rapidly revolving phospher-bronze disc no thicker and hardly stiffer than the paper this article is written on. The edge of this disc is blunt, and has been impregnated by an abrasive mixture of diamond dust and olive oil. There are nine directions in which the diamond saw will cut through the rough diamond—all other directions are too hard for practical division. Sawing is used for the same basic reason as cleaving—to divide the rough diamond through its imperfections and to obtain favorable shapes in the resulting fragments of the original rough stone; shapes which are favorable in that they closely resemble the shape of the finished gem. Shapes obtained from sawing are generally better in this respect than those obtained from cleaving.

After the diamond has been divided as outlined above, the diamonds which are destined for the usual brilliant cut are then subjected to being cut round on a lathe. The lathe tool is another diamond which is itself being roughly rounded at the same time. This is not a true cutting process; actually each diamond "chisels" tiny fragments off the other. Therefore, this operation, known as "bruting," must be carefully finished so that the gem will be perfectly round and so that the rounded surface will be smooth and true. Since this is not a cutting operation, "grain" is not important; bruting can be done in any direction.

The last process, and the only one to which all gem diamonds are subjected, is the polishing. As explained above, each facet in the gem diamond has a soft direction, and by knowing the orientation of that facet with respect to the crystal structure of the diamond, the cutter can accurately predict which direction on that facet will be the "grain"; that is, the soft direction along which he can polish.

The diamond to be polished is placed on a revolving soft metal lap. This lap is impregnated with diamond dust and a mixture of oils. If the diamond cutter has accurately prognosticated the "grain" of the particular facet being polished, the lap will wear away the diamond; if not, the diamond will cut its way right through the lap. With each facet and with each tiny variation during the polishing of each facet, there is a distinct soft direction which must be found. Combine this with the extreme need for accuracy and the diamond polisher obviously must be a very skilled artisan.

This brings us, however, to the second group of problems faced by the diamond cutter. So far, we have discussed mainly those problems caused by the peculiar nature of the diamond itself—now to see how the use to which the diamond is put affects its cutting.

One of the principal reasons why diamonds are so eagerly sought after is that they have an inherent brilliance and fire unequalled by any other gem stone. However, the rough diamond is no more brilliant than an uneven chunk of dirty glass. The difference is due entirely to the skill of the diamond cutter. Certain standardized proportions have been mathematically prescribed as creating the greatest brilliancy and fire combined with the most pleasing appearance.

These ideal proportions are complicated and unfortunately, are seldom followed closely enough by the cutter. Particularly in the last few years, due to the "get rich quick" philosophy prevalent in any booming industry where the demand is uncritical, the diamond cutter's skill has been prostituted so as to achieve greater production and greater yield from the rough diamond.

Basically, the proportions of the round, or brilliant cut diamond are as follows: The top or bezel facets are inclined at 34° with the table; the bottom, or pavilion facets, at 41° with the table. The facets must be exactly placed with reference to each other also, so that light entering the polished diamond will be reflected back and forth; its only possible exit being through the top of the diamond. Hence the brilliancy of the properly fashioned gem; practically all the light which enters the diamond leaves it through the top, or table facet. Any deviation in the finish, size, or placing of any of the 58 facets of the diamond result in a loss of light through the sides or bottom of the diamond, and a corresponding loss of brilliancy and beauty in the whole diamond.

Other shapes; the emerald cut, marquise, and the whole host of fancy cut stones have differing proportions; but for each shape there is one set of proportions which yields the most beautiful stone.

The diamond cutter must reconcile these arbitrary shapes with the original shape of the rough diamond and the location of the imperfections therein. Whereas the actual cutting of the diamond is almost surgical in its exactness and in the utter finality of a mistake; the planning of the cutting is quite like a problem in engineering. Plans must be drawn, examined, measured, tested; it must be certain that the results will suit the materials involved and functions of the object being made. Is the plan, therefore, a good one? Is it the best possible plan, considering all factors and the infinite number of possibilities?

Only if the answer is affirmative has the engineer or the diamond cutter done justice to his art; only if the planning and the execution of the plan proceed perfectly is the diamond a truly beautiful—an incomparable gem.

CABOCHON CUTTING UNDER THE AURORA

That "farthest north" group of readers of The Digest, the Alaskan Prospectors Society, has leased two claims from natives beyond the Arctic Circle and enough jade has been brought out this winter to keep the members busy in their elephant huts where their lapidary equipment is located. The society's base is at Elmendorf Field, Fort Richardson.

The society has 267 members, all War Department employes and military personnel of Fort Richardson. Since "evening" begins during the afternoon and the snow is getting deeper, good attendance is expected at the weekly meetings at Radio Station WVUG. There are no fees or dues, and a membership card is issued on the fourth attendance.

COVER PHOTO

The magnificent view of the Canadian Rockies in winter was taken by Harry Rowed, of Jasper, Alberta, who has been photographing remote beauty spots of the Canadian ranges for several years. His pictures frequently appear in *The Digest*. The photo was taken from the slopes above the Athabaska River.

CORRECTION

Through an oversight, the description of the photograph in Ben Hur Wilson's article in the December issue gave the age of the St. Peter sandstone as Silurian. The formation is, of course, included in the Ordovician system.

POLLEN GRAINS WRITE HISTORY

Climatic Record of 25,000 Years Found In Bottom of Michigan Lake

Fossil pollen grains and spores from the bed of Sodon Lake.

STANLEY A. CAIN
Cranbrook Institute of Science

If you were to take a walk and were startled to discover, as you skirted the marsh around a lake, a muddy figure of a man standing ankle-deep in water and muck, raptly and intently drilling a deep hole with a strange tool, chances would be that he was not prospecting for oil in Michigan, nor even that he was some kind of a mild lunatic. You would probably find him harmless and possibly even the purveyor of interesting tidings, for he would be a plant scientist tapping the earth for records of its past. You would have to pardon his lonely excitement, because in the fossilized pollen grains he brings to the surface he is finding one of the sources of a great history book as yet incompletely written—the history of Michigan's vegetation and climate for the last twenty-five thousand years.

Among the rocks in the collector's cases are thousands of fossils he never may have seen. These are the microfossils, an important part of the geologic record, which are visible only when carefully searched for with the hand lens or frequently only when examined in thin sections cut for microscopic examination. Such are the numerous kinds of foraminifera and radiolaria whose descendants swarm the seas today. Pollen grains and spores similarly provide a part of the picture of early life. The author, Dr. Cain, staff botanist at Cranbrook Institute of Science, Bloomfield Hills, Michigan, has been active in the new field of pollen analysis.

The branch of botanical science which examines pollen grains and spores, fossil and modern, is known as pollen analysis. European scientists have been studying fossil pollen stratigraphy and its significance with respect to vegetational history for more than a quarter of a century. It is, however, a relatively new field of research for American investigators.

Although the technique of taking the samples, preparing them for microscopic study, identifying and tallying the grains is exceedingly slow and tedious, the results frequently offer enough insight into the past to make the pollen analyst forget his aching muscles, cold hands, strained eyes, and taxed brain. One such intriguing find came when I was working on buried soils of the Piedmont of South Carolina. Working under a hot summer sun, one thought of magnolias and Spanish moss; yet when the pollen catch was later studied in the laboratory it gave indubitable evidence of the prevalence there at one time of a cool climate. Not only were pollen grains of spruce and fir found, now confined in the South to the highest mountains, but also grains of the Jack pine, which is now the northernmost pine species with a southern limit hundreds of miles north of the region being studied.

This evidence of the extensive southward influence of the glacial period has been corroborated by other investigators who have found the pollen of spruce and other northern species in the peats of Texas, Louisiana, and Florida.

Some of us at Cranbrook have recently started an investigation of the pollen to be found in the peat and marl along the shores of Sodon Lake, Oakland County, on the land of Mr. Gustavus D. Pope. As the sediments are brought up by the boring tool they are examined for stratigraphic features, such as changes in peat type, changes from peat to marl, the presence of shell layers, clay, sand, etc.

At each selected level, in this case six inches apart, a small sample is isolated and kept uncontaminated for the later extraction of the microfossils. For this purpose a piece of peat the size of a small bean is often enough to provide hundreds of pollen grains. Once the slides of a sample have been prepared they are systematically examined under a microscope, usually at magnifications of 200 to 400 times.

All pollen grains and spores are tallied as they are encountered, being classified usually as to genus, such as fir, spruce, birch, pine, oak, hickory, etc. When 200 or more pollen grains have been tallied (spores kept separate), the number of each kind is expressed as a percentage of the whole number identified and counted. Such a series of percentages is called a pollen spectrum and is representative of the composition of the fossil pollen grains at that particular level. It is immediately obvious that the successive pollen spectra, from the deepest layer to the surface, tell a story of the changing composition of the pollen rain during the period of time involved in the sedimentation.

Finding that the sediments at Sodon Lake change, after a few feet, from peat to marl and at the bottom to sand and blue clay, we are particularly lucky to obtain abundant pollen at each level, for the non-peat sediments often fail to yield fossils. There is no reason why we should not find in the changing pollen spectra a record of the vegetational and climatic history of Oakland County since the withdrawal of the continental ice sheet, perhaps 20,000 years ago, when Mr. Pope's lake was formed.

Studies already made in southern Michigan and elsewhere in the Middle West suggest the general picture —first, for a few centuries, chiefly grains of spruce and fir, then an increase in abundance of pines, until they compose the majority of the grains recovered. Following, often in the middle of the upper half of the sediments, the pollen grains of various species of oaks and hickories often are predominant. During this period, or toward the end of it, the more moisture-requiring species of maple, beech, basswood, etc., may have a temporary importance. In some localities there may be a rise in abundance of grass pollen.

In the northern Lake Forest region (from the middle of the Lower Peninsula of Michigan, northward) the development of oak-hickory may be slight, whereas in southern Michigan and northern Indiana, this period may be long and result in an almost complete exclusion of pines. In both cases there is an ultimate reversion in the last few centuries which indicates a return toward conditions more cool and moist. This is a definite long-time climatic trend, but it does not certainly mean that the glaciers will return again to Michigan.

Many questions posed by the science of pollen analysis must remain unanswered in these few pages, but it will occur to all of us to wonder how much and what kinds of pollen of existing vegetation get to the shores of Sodon Lake, and what part of it is currently being preserved. Pollen grains get about by being carried on the somewhat haphazard flights of bees and other insects, or by the extremely fortuitous distribution by wind. Most pollen grains are fated to waste their substance, and some of them, in passing, cause the reddened eyes and dripping noses of hay fever victims. A vast majority of the untold billions of pollen grains that drift about as dust in the air of Michigan every year eventually settles on the ground, on beds of moss, and into the water of lakes. It is this annual pollen rain, falling onto receptive swamp and bog surfaces and into lakes, that accumulates in the sediments of the centuries, becoming fossilized when conditions are suitable, and preserving a record of the plants which have lived in a region during millenia past.

The fossil record provided by pollen grains and spores is never a complete one of the flora of a region. In general, conditions are seldom right for the fossilization of organic remains; many forms never find their way into sedimentary basins; many others have soft structures or a chemical nature highly unsuited to preservation. It so happens that the walls of the pollen grains of most tree species contain a complex nitrogenous substance called sporonine that is very resistant to bacterial decomposition and the attack of fungi. The chemical resistance of the walls of these grains not only accounts for their excellent preservation, but also assists in their preparation on slides for microscopic study. Thus it happens that a large part of our knowledge of past vegetation is inferred from what is being learned from fossilized pollen grains of dominant trees.

Such prehistory is frought with many sources of error that must be guarded against in the use of pollen analysis; but the postglacial story which can be read from fossil pollen runs parallel with that of other types of investigation used by geologists, pedologists, and biologists, and in some cases, can add more details to the record than any other type of research.

REFERENCES: Erdtman, G., 1943, An Introduction to Pollen Analysis, XVI + 239. Chronica Botanica, Waltham. Cain, Stanley A., 1939, Pollen Analysis as a Paleo-ecological Research Method. Bot. Rev. 5: 627-654. 1944, Foundations of Plant Geography, XVI + 556, especially Chap. X. Harper & Brothers, New York. 1945, The Place of Pollen Analysis in Paleo-Ecology. Chron. Bot. 9:106-114.

FAMOUS LOST MINES

(Ninth of a Series)

VICTOR SHAW

The Lost Gunsight Mine

Judging by accounts which seem more plausible and factual, this Lost Gunsight, in mining parlance, cannot be considered a mine at all. For that matter, it isn't even a prospect; for according to all records it lies un-

touched by pick or drill just as Nature formed it. Actually, it appears to be an immense outcrop, or deposit, of a very high grade silver ore lacking any gold or other metals.

Naturally, its exact location is not known, but it is thought to be somewhere in the southern portion of Panamint Range, a chain of high mountains bordering the western side of Death Valley, in Inyo County, California. Incidentally, while the tale of its discovery is well known and many have lost their lives in futile search for it, there are less details on record concerning it than is the case with most other lost mines of the Southwest.

But from descriptions of the ore brought out by the finder, one thing is fairly certain. The ore probably is the silver sulphide called "argentite", for no other ore of silver so exactly fits the ore he had, though there seems to be no record of an assay or expert identification. However, of the eight types of ore mined for silver alone, argentite has the highest amount of the white metal, namely 87.1 per cent, the remaining 12.9 per cent being nothing but sulphur.

The story of this lost silver deposit involves the southern portion of the Panamints, where there are peaks rising from 9,000 to 11,000 feet sheer above the blinding white salt beds of Death Valley, which lies 276 feet below sea level. The granite flanks of this range are slashed by superheated canyons, which in daylight hours quiver like the flaming portal of Hades in mounting waves of a heat which in summer reaches 135 degrees.

It was into this inferno that, in the early 1850s, a wagon train of immigrants came slowly lumbering on its toilsome way to the gold fields of California. No doubt they carried water, having been initiated while crossing the arid country of Nevada, at that time part of Utah Territory. But while some of the weakest may have succumbed to heat prostration, most of them pulled through; and when they reached the California ranch towns along the coast, they told how one member of their party had mysteriously disappeared, somewhere in the waste now known as Death Valley. The man's name was Joseph Bennett, and they thought he had lost his way and died; but some years later the truth was learned, as our story presently reveals.

At that time, members of his party described Bennett as an active young man, who had joined them more to explore new country than for any other reason, for he seemed to have no trade and knew nothing of mining and prospecting. He had a habit of ranging out ahead of the wagons, acting as a scout and trail finder. Always he was far in the lead, sometimes a day or more in advance, but he always carried plenty of food and water with him. So they did not realize that he was lost, until after passing through the mountains he failed to appear. It was then too late to make any search for him.

The truth is, according to facts learned later, that when coming through the pass in what now is the Armagosa Range, Bennett was so far ahead that he hadn't water to take him to the wagons, nor even to wait for them. It is also possible that he took the fork leading to Furnace Creek, instead of keeping to the regular Immigrant Trail. At any rate, he missed the wagons and eventually found water and a great fortune beside, but never saw his immigrant friends again.

None of these accounts mention whether Bennett was afoot, or in the saddle; but, wagon trains in those days always had extra riding stock, and we may assume that he was riding a mule, or horse. In any event, when his water gave out he was forced to hunt a new supply, and no doubt he searched every likely place on the western side of the pass. And his horror may be imagined, when he faced the waterless hell below.

Victor Shaw, veteran prospector and Arctic explorer, at home in Liebre Canyon, California.

But he had to keep on over the glittering hot salt beds, toward the lofty range on the other side, where there was some shade, now with the scorching sun sinking behind the high sawtooth peaks. In one or another of those deep canyons there might be a spring, and he hoped to find one soon, for he was leading his mule and getting very weak.

Long afterward he could recall little of this, except that he kept stumbling southward along the base of those towering peaks, straining his sun burned eyes for a glimpse of green that meant water. Probably by this time he had become almost completely dehydrated as he dragged himself and mount across the miles of that sunken sink of salt baked to furnace heat. There is nothing like it, even in Utah's salt mantled Great Basin. However, all we know is that Bennett reached the west side of Death Valley, about where the Eagle Borax Works were installed many decades later.

Some three miles south of this point, Joseph Bennett luckily happened upon a small desert water hole. It probably saved his life, for although there are a few springs in some Panamint canyons, this "well" —now mapped as Bennett's Well, is the only known sweet-water on the west side of Death Valley. Surprisingly, it isn't close to the base of the range, but lies more than a mile below the sea-level rim of the sink and is slightly saline.

Anyway, Bennett afterward remembered that he rested at this water hole that night and most of the next day. Then made his way south along the base of those mountains, on the chance of finding better water and perhaps a trail leading to civilization. But the record of his movements, at this point, is extremely vague.

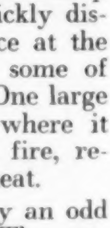
According to reports of his own story later, he wandered on along the mountain base for a day or two, perhaps covering twenty or more miles, before stumbling upon another spring of clear sweet water, in one of the larger canyons of that range. Doubtless he was guided to it by the striking greens of vegetation, for there were some willows there, also scrub oaks and some desert grass near the water.

At any rate, he was so exhausted and the place was so pleasant, in contrast to the sun blasted desolation outside, that he lingered for about a week building up his strength. What he found that was eatable is not mentioned, but there was his saddle animal. Also he may have had a gun, to hunt small animals and birds, as it was Indian country and the custom was to carry firearms.

Whatever the situation, Bennett did survive and it was while resting at that spring that he discovered the great silver outcropping. The first night there, he had built a small fireplace for making a hot drink, using some of the rocks scattered around, and there was plenty of dead greasewood and oak limbs for fuel. With little interest, he had noticed the rocks were of various colors, mostly shades of red, brown, or yellow, although some were black.

Later one day, when he saw the wood was getting scarce, he recalled the black rocks and reflected that if they chanced to be coal he could keep a fire all night. But he quickly discarded the idea, as a glance at the fireplace where he'd used some of them proved the contrary. One large chunk in the back wall, where it surely would have caught fire, remained untouched by the heat.

But, his gaze was held by an odd flash of light on that rock. The sunlight now coming down the canyon from the west was beyond all doubt being reflected from some kind of metal, and with mounting interest Bennett went to examine it more closely. Rubbed with a finger, it brightened and he picked it up, scraped the spot with the blade of his Bowie knife. It was metal, all right,



and soft; for when jabbed with the knife point it cut like a lead bullet. But it was too bright for lead, for where it was scraped it glittered like a new silver dollar. That's what it was—*silver!* Couldn't be anything else.

Startled by the discovery, he examined the canyon wall to find that the black rocks all came from a great ridge, which slanted on up the side of the mountain. It now was plain to see, very wide and long, with the brown and red rocks on both sides of it. Much excited, Bennett picked up a hard gray rock and hammered his speciman until it broke apart, which revealed that it was full of the white spots of silvery metal. It seemed to be all silver, except for holes filled with black powdery substance. Must be thousands of tons of it. A fortune!

Although Bennett knew little or nothing of chemical reaction, the specimen in the fireplace had been heated red hot, which burned out most of the sulphur leaving lumps and globules of almost pure silver. Argentite ore reacts like this, and there was an enormous deposit there.

However, he did know that he had stumbled upon something that would make him rich for life, and his next move was to get out to civilization, where equipment to mine it could be obtained. He felt rested and was sure he could make the tough journey, especially if he travelled mostly at night, or as long as he could see to find his way. Also, he must have decided that the most favorable direction was south. Westward it was all mountains, but the valleys ran south, offering much easier going with some shade in the late afternoons.

This is conjectural, but logical. At any rate, we know that Bennett broke off several samples from that big outcrop of ore, filled his canteen, drank all the water he could hold and headed south. No doubt he set out with eager haste, wholly unaware that his personal destiny had decreed that never would he see that place again.

We have no record of his journey through the desert hills, but from what is known of its tragic end, it must have been a repetition of what happens to all who traverse such regions without a suitable equipment and in total ignorance of how to combat the conditions. For we do know that eventually and by sheer chance he was discovered, almost dead of hunger and thirst and raving crazily, by a prospector who took him to Needles, still clinging to his samples of silver ore.

As a result of his terrible experience, Bennett for many weeks was delirious and practically insane, but was well cared for by the friendly old-timers of that little desert settlement. In fact he must have had an exceptionally tough physique to have survived at all. Even so, considering reports of his later peculiar activities, he was left with a mental complex from which he never fully recovered.

When finally he regained his senses, he identified himself and told how he had joined and then lost the wagon train, although his memory of what transpired afterward was disconnected and vague regarding many essential details. Particularly, this was evident concerning the route he followed after starting south from his rich discovery and he had no idea how long he had been wandering through the desert hills. But, he was boastfully positive that he could relocate his silver mine.

Accordingly, when recovered enough to travel, he outfitted for an expedition to the northward, but was forced to return balked but not defeated, when his supply of food and water gave out. And, still sure of ultimate success, made a second trip, which also failed; then he made a third attempt, in which he made use of a device that he was absolutely certain would lead him straight to his objective. And it was this odd arrangement, which not only proves he was mentally unbalanced, but which has since given this lost mine its name.

For these expeditions he had bought from a miner one of the old smooth-bore rifles, for which he then had a blacksmith fit with a front sight of silver made from the metal in his ore samples. And he assured everyone, that this gunsight would lead him straight to that mountain of silver from which the metal came. However, when even this search failed, Bennett must have been completely discouraged, for we have no record of any subsequent expeditions.

But many others tried to find that rich outcrop with no better success. In fact, a record of a score of deaths is said to exist, of those who went after it and never returned from the ill-fated quest. And yet, in subsequent years, quite a few quartz-gold deposits were discovered in both the Panamint Range and adjacent mountains, most of them probably by old-times knowing nothing of modern methods. And so, after gophering of surface values, the deposits were abandoned, as the region lacked adequate water for profitable mining and milling. Today, however, water for concentrating mills can be obtained by drilling after a promising deposit is discovered, although the initial cost will be prohibitive for a small-scale miner, in a majority of cases.

Eventually, there is little doubt that the entire Panamint Range will be thoroughly prospected and mined, for geologically its rock formation is most promising for deposits of gold, silver, and other commercial ores. Its core is composed of igneous rocks, which are intrusive in, and in places are overlaid by, metamorphic sedimentary rocks. Therefore, it is a very favorable area to prospect; in addition, due to its unfavorable climate and lack of water, it is one of the few left that still is very little explored.

Anyone conducting a search in this region should not only be sure to have enough water, but also should have the geologic map of Inyo County, and the topographic maps of both the Ballarat and Furnace Creek Quadrangles. These are published by the State of California, and may be obtained of the State Bureau of Mines, located at Ferry Building, San Francisco. They sell at a nominal price.

Paved roads now run both north and south of Death Valley, and fair desert roads completely encircle the Panamint Range. But be sure the car is in first class shape before venturing into this region, and make certain there also is an ample supply of gas and oil. For if the engine breaks down, or runs out of fuel, your situation in this torrid wilderness will in no way differ from that of those who have died here. In winter months, with due precaution, there is little danger.

CLASSIFIED ADVERTISEMENTS

Rate 6c per word. Minimum advertisement $1.50.

MINERALS

MINERAL SPECIMENS: Micro-mount and Thumb-nail sizes. Write today for free list. **J. E. Byron, Mining Engineer, 1240 Pearl St., Boulder, Colorado.**

AGATE — $8 the square inch. Grind, polish, fit in mountings like Grieger's No. 3 mm's. Your profits will delight you. I have to dig my claim, no time to make jewelry. I'll let you do it. This new agate is a whiz. Write for description. Sent on approval. Reference please. **W. W. Wilkins, Box 203, Deming, New Mexico.**

EIGHT DIFFERENT GLITTERING MINERALS. Some in various clusters of colors. Polish smoothly. From Blue Ridge Mountains and Shenandoah Valley rivers. Select your order now by pounds from special pieces. $2.60 per 2 lbs. Postpaid. Assorted. **Monroe's, P. O. Box 384, Waynesboro, Va.**

OBSIDIAN — Black and red, or silver sheen. Fine cutting material. In pieces up to two pounds at 40 cents a pound. I pay postage. Money back guarantee. **James Irvine, Malin, Oregon.**

NOTICE TO DEALERS and ROCK CUTTERS. I have a few hundred pounds of mixed cutting material at wholesale prices, includes agate, jasper and petrified wood. This is good slabbing and cabachon material. Most all colors and many combinations. 10 pounds for $5.00, 25 pounds for $10.00, 50 pounds for $16.50. 100 pounds or more at 25c per pound, transportation extra. Send for my price list of New Mexico mineral specimens and fluorescents. Special discount to schools and dealers. Will trade cutting material and mineral specimens for good lapidary equipment. **R. H. HARTSON, Box 98, Winston, New Mexico.**

EDEN VALLEY PETRIFIED WOOD — Limb sections ½ to 2 inches in diameter with agate markings. Cane (Rare) shows leaf markings and designs. Fern Fronds, Blackwood, Palmwood, Opalized wood in several colors. Algae, black and brown. **ED SASS AND JOHN HENDRESCHKE, FARSON, WYOMING.**

"**AUSTINITE**" a new one, a zinc arsenic mineral, small brilliant white crystals on brown background. Have you seen this one? You will welcome it as an addition to your collection. $1.50 to $5.00 post paid. **W. T. Rogers, 1230 Parkway Ave., Salt Lake City 6, Utah.**

WANTED—Would like to hear from dealers having loose agates suitable for polishing. **Charles Preheim, Freeman, S. D.**

25 BEAUTIFUL, colorful Ozarks, 2½" specimens, including 3 cutting and polishing materials, blue and brown chalcedonies, rose and green jasp-agates, red jaspers, drusy and milky quartz crystal clusters, calcites, onyx, breccias, colites, crinoids, brachiopods and vari-colored flints. Sent postpaid for $2.00. **John Jennings, Eureka Springs, Ark.**

FRIENDS—I must get rid of my surplus stock at once. Choice mineral specimens, and many can be cut. Only 15 cents per pound. Send in your orders now. Selling due to serious illness. Your chance to start in business. Lots of it worth 50 cents to $1 a pound. **Hurry Back Trading Post, Goldfield, Nevada.**

FRANKLIN, NEW JERSEY offers the finest fluorescent stones for short wave (Mineralight) in the world. If you want the best send for either our 25 pound collection for $10.00 or the 10 pound collection for $5.00. See the reds, greens, purples, blues, and yellow (calcium Larsenite) in an array of colors that will put new life into your present collection. All stones guaranteed to be bright and every inch fluorescent. **State Minerals, 1034 Bloomfield Street, Hoboken, New Jersey.**

BEAUTIFUL AGATIZED WOOD from North Dakota. Assorted colors two pounds for $1.00. (Please include 30c postage). **L. Manning, Hettinger, North Dakota.**

FOSSILS

SPECIAL—A generous assortment of fossils from the Bad Lands of South Dakota for $2.00 postpaid. Also brown opal at $2.00 per pound. Sawed slabs of gem material, 10 slabs for $2.00 postpaid. **T. H. Haskell, Jr., Box 75, Wasta, South Dakota.**

IOWA UNDER THE SEA—Pre-historic sea fossils as we take them from the prairie clay hills of Iowa. 25 assorted specimens for $1.00, postage paid in U. S. Make nice Christmas presents. **GLENN MICHELL, Rockford, Floyd County, Iowa.**

EXCHANGES

Have 3 tons of crystals, fossils (not small shells) minerals, rocks, Colorado, Kansas, old barb wire. For above mentioned, including polished material, Indian relics, coins, write**Burris, 419 Oak, Augusta, Kansas.**

BOOKS and MAGAZINES

LAUCK'S NEW PROSPECTOR GUIDE, now in its 4th printing, comes to you in a new weatherproof cover. No trip or meeting complete without this easy to carry booklet. Sent postpaid for 50c each. **E. R. Hickey, 2323 So. Hope St., Los Angeles 7, Calif.**

THE ROYAL GORGE — 50c illustrated booklet printed in colors, describing recent operations in Colorado's famous fossil beds and mineral occurrences. Where every passenger train stops for mere scenery alone. **F. C. Kessler, Canon City, Colorado.**

OUT-OF-PRINT GEOLOGICAL BOOKS supplied. Specializing in government publications. Send for stock list. **J. McC. Zimmerman, 33 Charles Street, Hagerstown, Maryland.**

MISCELLANEOUS

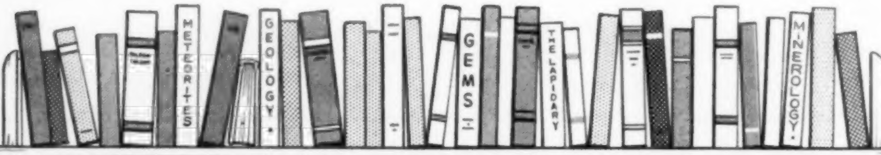
FINE PAPERWEIGHTS — Pen mounts. Matched sets, many types. Featuring the Texas fluorescent turitella. Sent on approval. Discount to dealers. **Clay Ledbetter, 2126 McKenzie, Waco, Texas.**

FREE — GEOLOGIC and SCENIC COLOR SLIDE CATALOG. Special introductory offer — three color slides of unusual interest — $1.50 value for only $1.00. **Heald-Robinson, 2202 N. Santa Anita Ave., Altadena, California.**

FOR SALE: 85 watt G.E. Mercury vapor type fluorescent lamp, transformer, cabinet and 26 stones, a complete display. **Russell L. Kent, Hepburn, Iowa, near highway No. 71.**

MICROMOUNT BOXES for your micro specimens, Sands, Diatoms, etc. ⅞" square x ⅝" deep. Dull black box with white lid. $1.00 per doz. $8.00 per hundred. **Mrs. C. A. Belz, Line St., R.D. Lansdale, Pennsylvania.**

FRANK LYMAN SELLS FINE SEA SHELLS. ALL ARE SCIENTIFICALLY LABELED AND CLASSIFIED. PUBLISHER OF "SHELL NOTES". WRITE: FRANK LYMAN, LANTANA, FLORIDA.



The BOOK SHELF

The Gem Hunter's Guide by Russell P. Macfall. A list of all important gem locales in the United States with information on not only where to find gems, but how to find them. Well illustrated. **Price: $1.00.**

Handbook of Uranium Minerals by DeMent and Dake. An exposition and catalog of the Uranium and Thorium minerals, including methods for their detection, location and exporation. An invaluable aid to all prospectors and miners on the lookout for these important minerals. **Price: $1.50.**

HISTORICAL GEOLOGY by Prof. Russell C. Hussey. The geologic history of North America during two billion years. More than 300 illustrations. The story of the development of the plants and animals and the early history of man told with a minimum of technical terms. A text used at the University of Michigan and many other schools. This is an invaluable addition to every earth science library. **Price $3.75.**

The Art of Gem Cutting by Dake and Pearl. Anyone who contemplates pursuing the hobby of gem cutting should have a copy of this book. Written by H. C. Dake, editor of The Mineralogist Magazine, and Richard M. Pearl of Colorado College, it presents a wide variety of material on the most interesting of all hobbys. **Price: $1.50.**

Mineral Collectors Handbook, by Richard M. Pearl of Colorado College. A useful volume for the collector. Includes classification of the minerals and tables for gem identification. Lists mineral museums, mineralogical societies, and sources of publications on localities. **Price $3.75.**

The Earth Science
DIGEST

BOX 581 **ANN ARBOR, MICHIGAN**

BOOK REVIEW

Glacial Geology and the Pleistocene Epoch

RICHARD FOSTER FLINT
John Wiley & Sons, Inc. $6.00
589 pp. Illustrated

This book, by Professor Flint, of Yale, is a compendium of the leading facts that have been assembled on the last million years of earth history, with emphasis on the latest of the great glaciations.

The publishers describe the volume as "a discussion of the principal facts of the Pleistocene epoch—treated from the point of view of its outstanding characteristic, glaciation. . . . . . It is a compact reconstruction of the history of the Glacial Epoch for geologists, ecologists, archeologists, geographers, and others interested in the prehistoric realm . . . ."

So much has been written about this fascinating part of the earth story that the exercise of selective judgment was a chief task of the author. The result is a volume which reviews the older theories and presents the new, based on intensive field work which must, perforce, continue through our time, for there are many unsolved problems. These are frankly stated.

A few topics in the book may be cited to indicate its scope—glacier ice, glacier movement, loess in North America, Wisconsin stratigraphy, glacial stratigraphy of Europe, South America, the Alps, New Zealand, summary of possible causes of glaciation, crustal warping, climatic fluctuations, pluvial lakes in the American West, evolution of the Great Lakes, fossil man.

Most Americans have about them at all times the visible evidence of the work of the latest ice sheet. Human evolution took place during the Pleistocene. Today some 10 per cent of the land surface is still ice-covered. (The maximum during the Ice Age was about 30 per cent).

Most of us are prone to regard the latest glaciation as a phenomenon of the past. But a geologically-minded penguin, on the Antarctic ice, would disagree. For him, as the book reminds us, the Ice Age is here and now. It may well be that we are, as Professor Flint asserts, only about half-way through the great freeze which began approximately a thousand millenia ago.